CDM Camp Dresser & McKee

Report

Remedial Investigation/Feasibility Study
Workplan
Dallas Housing Authority
Operable Unit 02
January 1994

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Operable Unit 02
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Dallas Housing Authority
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Section 1
Introduction

Site Location

The Dallas Housing Authority's (DHA) West Dallas Development (DHA Site) is located in West Dallas, Texas. The DHA site comprises approximately 460 acres just south of the Trinity River and north of Interstate 30 along Hampton Road. The DHA site is bounded by Westmoreland Road on the west, Hampton Road on the east, Canada Drive and the West Fork of the Trinity River on the north, and Singleton Boulevard to the south (Figure 1-1).

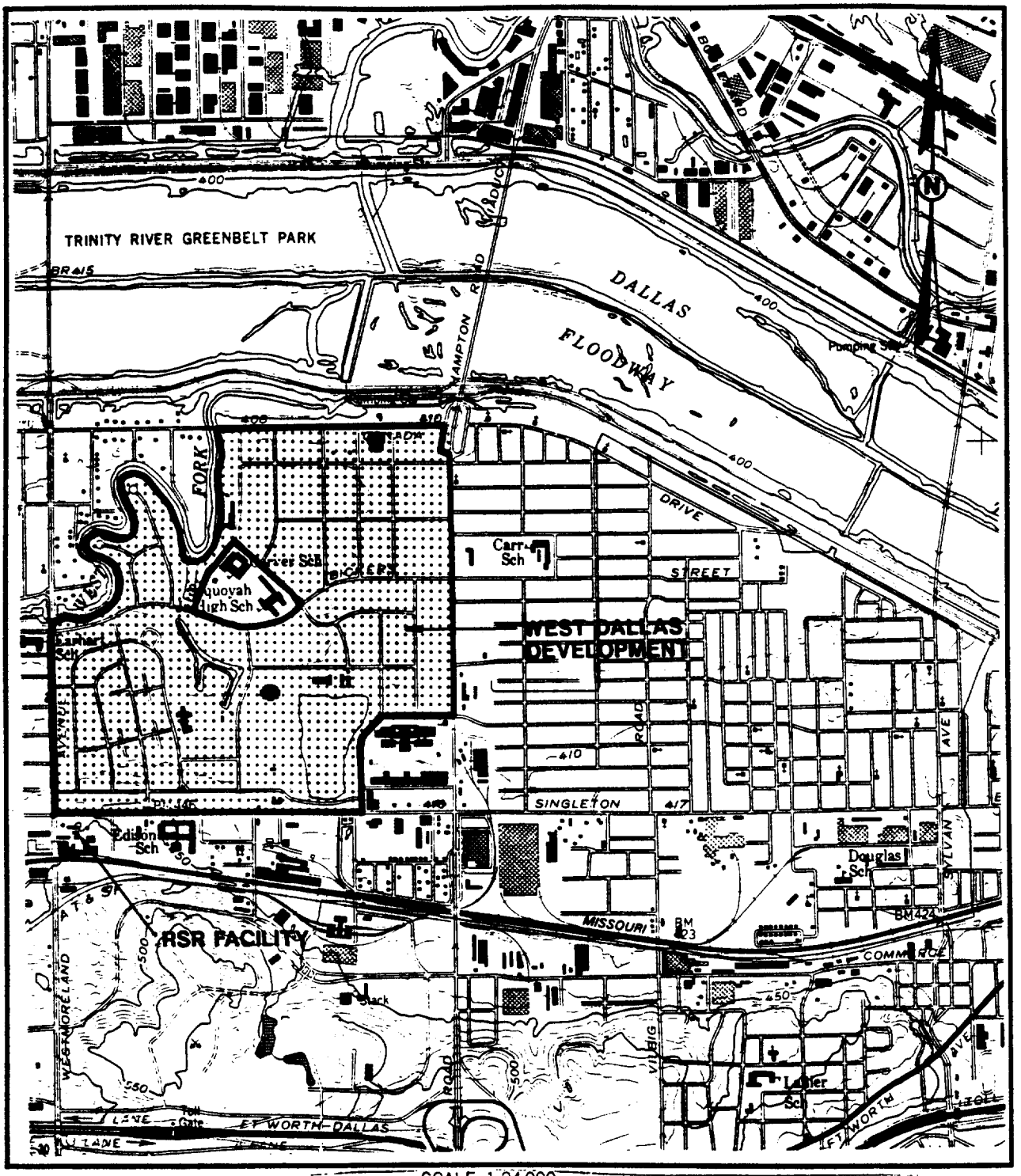
The DHA site consists of 3500 housing units along with several maintenance facilities, schools, and day care centers. According to the City of Dallas, the DHA site is zoned for multi-family apartments. Land use in the general area includes residential, industrial/manufacturing, floodplain, and commercial retail.

The DHA site is located within the boundaries of the RSR Corporation site. The boundaries of the RSR Corporation site study area extend from Loop 12 north to the Trinity River, then east to Fort Worth Avenue, then south to Interstate 30, and then west to Loop 12 (Figure 1-2). A preliminary assessment was performed on the RSR Corporation site by the U.S. Environmental Protection Agency (EPA) in August 1991 for the purpose of hazard ranking. Based on results of the hazard ranking system (HRS) package, the entire RSR site is proposed for addition to the National Priorities List or NPL (i.e., Superfund site). The DHA site has been designated as Operable Unit 02 of the RSR Corporation site.

The primary objectives of the remedial investigation/feasibility study (RI/FS) are as follows:

- To determine the nature and extent of contamination necessary to evaluate remedial alternatives and address any threat to the public health, welfare, or the environment caused by the release or threatened release of hazardous substances, pollutants or contaminants at or from the site by conducting a remedial investigation; and

- To determine and evaluate alternatives for remedial action (if any) to prevent, mitigate or otherwise respond to or remedy any release or threatened release of hazardous substances, pollutants, or contaminants at or from the site by conducting a feasibility study.



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RI / FS WORK PLAN

SITE LOCATION MAP

DALLAS HOUSING AUTHORITY
DALLAS, TEXAS

Figure No. 1-1

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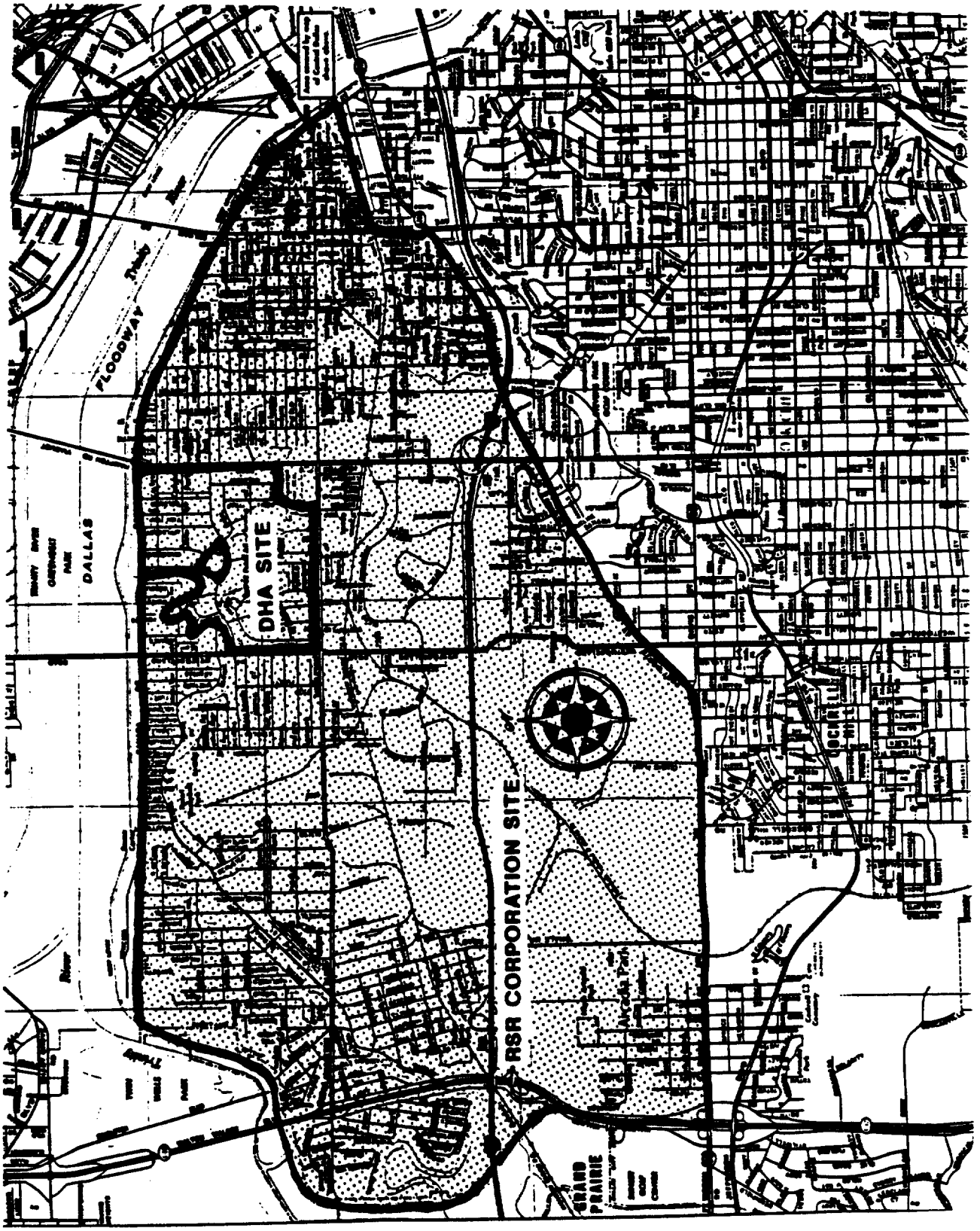

RI / FS WORK PLAN

BOUNDARIES OF RSR CORPORATION and DHA SITES

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DALLAS HOUSING AUTHORITY
DALLAS, TEXAS

Figure No. 1-2

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To obtain these objectives, the primary tasks of the proposed RI/FS will be as follows:

- Incorporate previous data collected by EPA and CDM regarding surface lead and other elements contamination of George Loving Place in the DHA site;
- Characterize the site's physical characteristics;
- Delineate the boundaries of the suspected historical landfill at the DHA site, within the scope of this project;
- Determine the nature and extent of contamination in the soil, ground water, surface water, sediments, and air to the degree necessary to evaluate remedial alternatives;
- Determine the rate and direction of contaminant migration, if present;
- Evaluate water use and location of water wells within a 3-mile radius of the DHA site; and
- Review current Baseline Risk Assessment (BRA) and FS, and update these reports and evaluations as necessary based on the new data.

Approach to Performing Concurrent Demolition and Soil Removal With the RI/FS

Based on the results of previous investigations performed by CDM, and upon the Administrative Order on Consent (AOC) for a Remedial Investigation/ Feasibility Study and Removal Actions dated August 9, 1993, EPA has given DHA approval to initiate demolition of apartment units and removal of soil in the northeast portion of the DHA site. The demolition and removal action will be performed concurrently with the RI/FS activities. To this end, certain data collection and analysis activities will be shared by the two programs. An overview of the overall approach is presented below.

The objectives of the demolition and removal activities are summarized as follows:

- To perform all necessary removal actions to abate any imminent and substantially hazardous conditions with the DHA site; and
- To ensure that all precautions are employed to prevent hazardous substance release during these activities.

The demolition and removal activities have been formulated based upon observed concentration of lead detected in soil samples and indoor dust samples collected from over 170 locations distributed evenly across the entire

DHA site. Two particular issues arise from these facts. First, characterization for lead site-wide as part of the RI/FS is unnecessary because of the previous thorough investigations. Second, the remedial action goals for the demolition and removal activities need to be refined to account for additional chemicals of concern - namely arsenic and cadmium as detailed by EPA. In addition, arsenic and cadmium need to be further characterized to fulfill the objectives of the RI/FS.

Therefore, the first step in both the RI/FS and the demolition and removal activities involves performing appropriate arsenic and cadmium laboratory analyses on selected groups of the archived soil samples collected during previous CDM field investigations. The objectives of analyzing the archived samples include:

- Determining the distribution of arsenic and cadmium concentrations site wide;
- Establishing site specific arsenic and cadmium background concentrations for use in the risk assessment;
- Determining the vertical distribution of arsenic and cadmium within the limits of the soil removal area; and
- Determining the areal and vertical distribution of arsenic and cadmium with the limits of the grid sampling program that will be conducted as part of the demolition and soil removal action.

Once the archived samples have been analyzed and evaluated, both the soil removal and grid sampling tasks can be initiated. All data collected during the analysis of archived samples, and the soil removal and related grid sampling activities, will be included in the RI/FS.

Given that use of analyses performed on the archived samples will adequately characterize metals contamination in surface and shallow subsurface soils site wide, the focus of the RI/FS field activities will be as follows:

- Characterize the impact of rainfall runoff from impacted areas on receiving waters and the sediments in adjacent water courses and lakes; and
- Characterize the nature and extent of contamination that may be related to previous fill activities conducted in the central portion of the DHA site, especially as it relates to organic and inorganic contamination of surface and subsurface soils, groundwater, surface water and sediments.

Evaluation of air quality impacts related to the DHA site will be made based on air sampling conducted by the City of Dallas. No additional air sampling is proposed by CDM as part of the information related to the RI/FS. Please refer to the Demolition and Removal Action Plan for additional air sampling proposed during the demolition and removal activities.

Components of the RI/FS Workplan

The RI/FS Workplan and associated support project plans (i.e., Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (H&SP), address only those activities related to performing the RI/FS. A separate workplan and support documents have been prepared for the demolition and soil removal activities. The grid sampling program is part of the soil removal activities.

The RI/FS Workplan developed for the DHA site follows the "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA, 1988). The workplan describes all activities to be conducted during the RI/FS to achieve the objectives stated above. Components of the workplan include: the introduction, a discussion of site background and the site physical setting, a preliminary identification of remedial goals and applicable or relevant and appropriate requirements, a presentation of data quality objectives and sampling program rationale, and an overview of the RI/FS program to be implemented at the DHA site. Specific attention will be given to project deliverables and schedule. Details of sampling and analysis will be provided in the RI/FS FSP, QAPP, and the H&SP. The concepts, protocols, and key details upon which the FSP and QAPP are based are outlined in this document.

2 Section Two

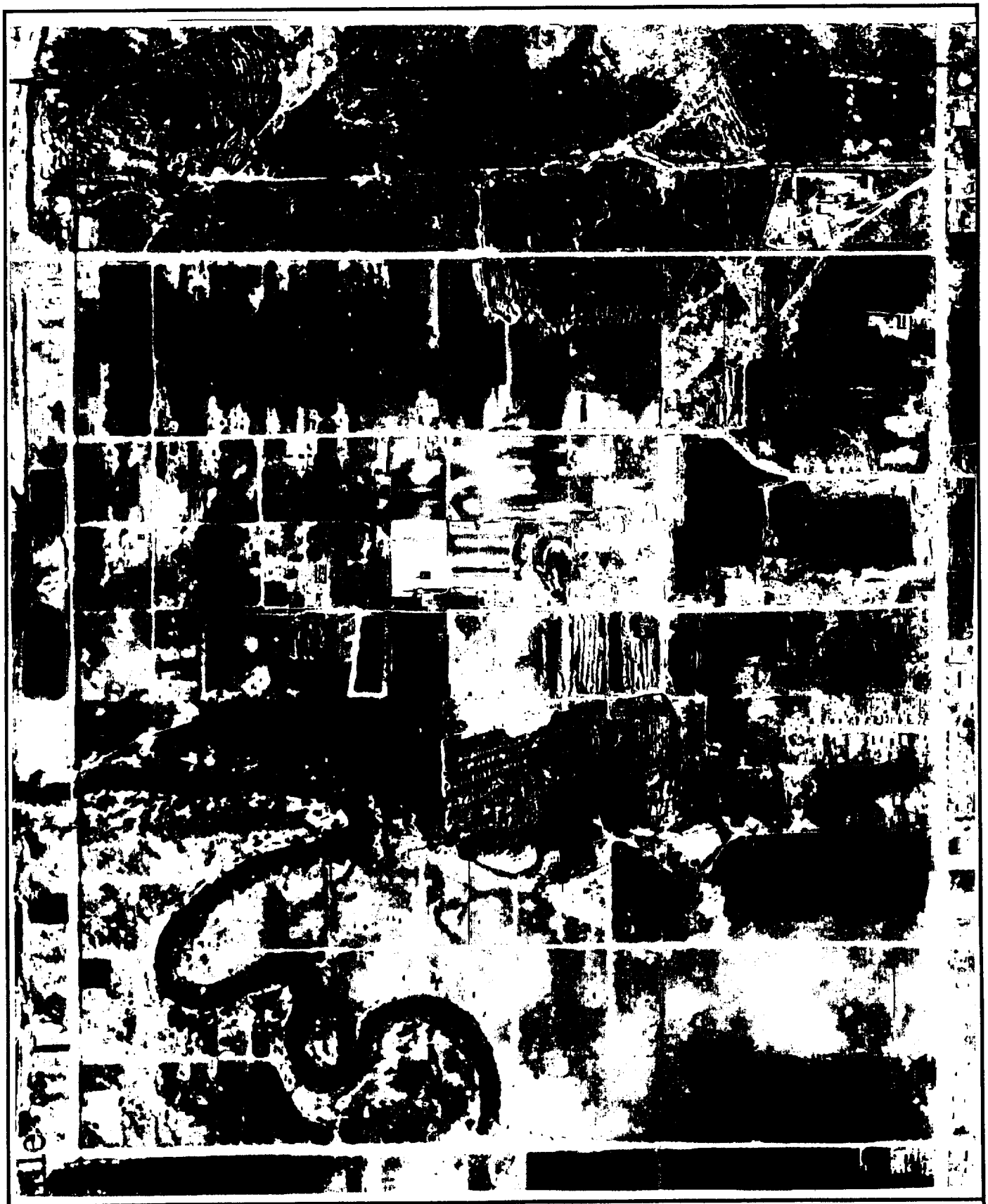
Section 2
Site Background and Physical Setting

Site Background

Based on aerial photographs taken between 1942 and 1991, it appears that the area now occupied by the DHA site was relatively undeveloped prior to 1942 (Figure 2-1, 1942 aerial photograph). Parts of the site around Fishtrap Lake and West Lagoon were used for sand and gravel mining. An increase in the number of private residences occurred on the DHA site between 1942 and 1951. A good portion of the mining excavations noted above had been filled by 1951. Several industrial facilities were developed south of the DHA site along Singleton Boulevard between 1942 and 1951. By 1958, the public housing development at the DHA site had been completed and all former mining excavations filled.

Concerns regarding human and environmental exposure to lead at the RSR Corporation site began in the early 1970s as a result of smelter emissions from the nearby RSR Corporation smelter. The smelter stack for the RSR facility is approximately 600 feet south of the nearest housing units of the DHA. The smelter began operation in 1934 as Murph Metals and was acquired by RSR in 1971. The smelter was later purchased by its current owner, the Murmur Corporation, in May 1984. Prior to this purchase (February 1984), the smelter shut down a majority of its operations.

Environmental concerns regarding the smelter and surrounding community escalated in the mid-1980s as a result of several investigations which assessed potential environmental contamination and human health impacts resulting from lead contamination (e.g., elevated levels of lead in the blood of children). According to the von Lindern study (von Lindern, 1982), nearly 14 percent of the children residing within a one-mile radius of the RSR smelter had blood lead levels exceeding that which the Center for Disease Control (CDC) associated with lead toxicity at the time of the study (i.e., 25 micrograms per deciliter or µg/dl). [Note: In 1991, the CDC established a blood lead contamination of 10 µg/dl as a level requiring a re-test in three to six months, and a level of greater than 20 µg/dl as representing an elevated lead level]. According to Dr. Von Lindern, the 1982 EPA/City of Dallas/CDC blood lead study of children in West Dallas identified the principal sources of lead to soil and air as the RSR smelter and high traffic density streets; "Their relative contribution to blood lead levels was roughly quantified by the EPA as 90% due to the smelter, 10% due to traffic."



RI / FS WORK PLAN

AERIAL PHOTOGRAPH (1942)

DALLAS HOUSING AUTHORITY
DALLAS, TEXAS

Figure No. 2-1

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As a result of the aforementioned concerns, investigations of environmental media in the RSR Corporation site focused on atmospheric deposition of lead on soils from the RSR smelter and use of smelter wastes (e.g., slag and battery chips) as fill material in local neighborhoods. The EPA conducted investigations in the RSR Corporation site in 1982, 1983, and 1991. The Texas Natural Resources Conservation Commission (TNRCC), formerly the Texas Water Commission (TWC), also conducted an investigation in the area in 1991. Analytical results from the EPA's and TNRCC's investigations identified high lead and arsenic content and elevated cadmium in the soil.

Removal actions at the DHA site and surrounding area began in 1983 and continued into 1985 as a result of pre-trial agreement reached between the State of Texas, City of Dallas, and RSR/Murph Metals. Removal activities have included a 40-acre area within a half mile radius of the smelter and a 200-foot by 200-foot area east of the Boys and Girls Club off of Singleton Boulevard.

This initial removal program at portions of the DHA site and areas adjacent to the RSR facility was completed in 1985. TNRCC notified the EPA in July 1991 that contaminated soil and debris and/or slag was still present at the RSR Corporation site. Contaminants included lead, arsenic, and cadmium both at the RSR facility and in adjacent residential soils. In conjunction with TNRCC, EPA reviewed remedial activities of the 1980s and began extensive sampling in the area in August 1991. As a result of the EPA's study, several removal actions were conducted by the Emergency Response Branch of the EPA. Removal actions (i.e., excavation) were conducted on the basis of elevated lead and/or arsenic levels in soils at portions of the DHA site (i.e., Kingbridge Park) as well as soils in residential areas of the RSR Corporation site, and in Dallas Independent School District (DISD) properties such as Amelia Earhart Elementary, Thomas A. Edison Middle School, and Carver Learning Center.

Environmental Setting

A considerable amount of information is currently available regarding the environmental setting of the DHA site. This information addresses various site physical characteristics: (1) general physical features, (2) soil, (3) geology, (4) surface water hydrology, (5) hydrogeology, and (6) meteorology.

General Physical Features

The DHA site is located south of the Trinity River floodway west of downtown Dallas, Texas (Figure 1-1). The DHA site has been improved with a number of structures including housing units, administration complexes, and playgrounds. Changes in drainage have been made to the native landscape, which have included excavation/dredging of Fishtrap Lake and West Lagoon. The area surrounding the DHA site is a mixture of industrial, commercial, and residential properties. In the DHA site area, most residential properties are west of this site across Westmoreland and east across Hampton Road. A

number of industries such as Dallas Drum, GAF Industries, and the former RSR smelter operate or have operated facilities south of the site along Singleton Boulevard.

The topography of the DHA site is very flat (one to two percent slopes). Steeper slopes are present to the south of the site just behind the RSR smelter and along Interstate 30. The highest elevation at the DHA site is approximately 450 feet above mean sea level near the south boundary of the site along Singleton Boulevard and just east of the Boys and Girls Club. From this location, the site slopes to the north/northeast toward a former channel of the West Fork of the Trinity River.

Soil

Soil sampling across the DHA site during CDM's initial site investigation indicated that most of the soils belong to the Houston Black-Urban complex soil association. The Soil Conservation Service (Soil Survey of Dallas County, 1980) has mapped the DHA site and adjacent properties as Houston Black-Urban complex and Urban land. The United States Department of Agriculture textural classification of the soils in this complex is clay loam and clay. A large portion of these soils have been disturbed due to the urban setting, and fill is present in a number of locations.

The Houston Black-Urban land complex consists of moderately alkaline, dark gray to black clay soil with low permeabilities. Runoff and erosion hazard are medium. These soils have low strength and are susceptible to cave-in during excavations.

Geology

The DHA site is located in Dallas County, which is in the north part of the Texas Central Plains. The DHA site consists of alluvial and fluvatile terrace deposits including gravel, sand, silt, and clay. Underlying these alluvial deposits, according to the Geologic Atlas of Texas (McGowen et. al., 1987), are the Eagle Ford formation followed by the Woodbine, Grayson Marl and Main Street Limestone (undivided), and Antlers formations.

The Eagle Ford formation is a marine shale consisting of sandstone and limestone. Installation of soil borings and monitor wells at the DHA site during CDM's site investigation encountered the top of the Eagle Ford shale at a depth ranging from 8 to 21 feet. The shale was dark gray to black, hard and fissile.

The Woodbine formation consists of medium to coarse sand and sandstone. The expected thickness of the Eagle Ford shale and the Woodbine Formation in the site area are approximately 450 feet and 400 feet, respectively (Geology of Dallas County, 1957). Geologic formations below the Woodbine formation are not expected to be impacted by the DHA site and, consequently, are not addressed in this RI/FS.

Surface Water Hydrology

The majority of precipitation in the area is in the form of rainfall, which occurs throughout the year, with peak rainfall during the spring and fall seasons.

The DHA site is part of the State-designated watershed segment 0805 and subwatershed of the Dallas West Bank. The Trinity River and associated floodway lies approximately 0.5 miles north of the DHA site. The northwest side of the site is bordered by a former channel of the West Fork of the Trinity River. A small lake and pond, Fishtrap Lake and West Lagoon, are also located on the site.

Fishtrap Lake and West Lagoon serve as water storage/retention ponds for local stormwater runoff. Fishtrap Lake is a 21.2-acre body of water with a depth of 2 to 6 feet. Five stormwater outlets discharge into the lake. West Lagoon was a 1.2-acre serpentine body of water with a maximum depth of 4 feet. Overflow from Fishtrap Lake, during period of high rainfall, flows to West Lagoon and on to the Trinity River via pipes underneath Bickers Street and the west levee pump station. Fishtrap Lake and West Lagoon are currently being renovated to meet the City of Dallas' 100 year frequency storm requirements. At the time of this writing, West Lagoon had been transformed into a drainageway. Its feature, as shown on the drawings, still exists.

Hydrogeology

According to the Texas Water Development Board (1990), the DHA site and surrounding area are underlain by unconsolidated alluvial and terrace deposits followed by the Eagle Ford and Woodbine formations. The alluvial and terrace deposits yield small to large amounts of fresh water to wells, depending on their proximity to surface water. The Eagle Ford formation yields only small amounts of water to wells in the area. The Woodbine formation yields moderate to large quantities of fresh to slightly saline water to municipal, industrial, and irrigation wells. Regional groundwater flow in the Woodbine formation is to the east.

No onsite groundwater usage occurs at the DHA site. Offsite usage of the groundwater typically occurs from wells screened in the Woodbine formation and deeper aquifers. Alluvial and terrace deposits in the area are typically not utilized for water supplies. The City of Dallas uses surface water for public water supply. A survey of existing water wells in the area has been conducted.

Groundwater from the uppermost water-bearing formation at the DHA site was evaluated from four monitor wells installed during CDM's site investigation. Three of these monitor wells are located in the Kingbridge Park area, and one well is located near the DHA Rupert Street maintenance facility. Local groundwater flow direction at the DHA site, as based on current data from the four existing onsite monitor wells, is to the north- northwest. (This information will be supplemented with the addition of the four monitor wells to be installed during the RI.) The groundwater from these wells was slightly

saline (total dissolved solid or TDS content of 1,100 to 2,540 mg/l) and the static water level depth ranged from 5 to 11 feet from the top of the well casing (flush mounted wells).

Meteorology

CDM reviewed local climatic data (Dallas/Ft. Worth area) from the National Oceanic and Atmospheric Administration (NOAA). This review included monthly data for 1991 and 1992 as well as the annual summaries for 1962 through 1991. The data collected by the NOAA included temperature, precipitation, and wind speed/direction.

According to the NOAA data, the monthly average air temperature in the Dallas/Ft. Worth area in 1992 ranged from a low of 46.9°F in January to a high of 84.3°F in July. Total precipitation for 1992 was 42.2 inches. In 1991, this total was 53.5 inches. The mean precipitation for this area over the last 29 years is 32.5 inches. From 1962 to 1991, the annual precipitation ranged from 20.5 to 53.5 inches. In 1991, the resultant wind direction was from the south/southeast (166°) and the average wind speed was 9.4 miles per hour. Prevailing wind direction through 1963 was from the south.

Summary of Previous Site Investigations

Environmental and engineering investigations have been conducted at both the DHA site and the RSR Corporation site. In the summer of 1982, the EPA, CDC, and City of Dallas conducted an in-depth study of soil lead and blood lead levels in areas around the RSR smelter. The EPA conducted further testing of soils in 1983, in an area near the Boys and Girls Club.

In 1985, Carter & Burgess in association with WAPORA, Inc. (Carter & Burgess) conducted an engineering and environmental analysis of Fishtrap Lake. Terra-Mar Inc. (1987) conducted an environmental investigation regarding drainage improvements of Fishtrap Lake and West Lagoon. These studies primarily addressed the water quality and hydrology of Fishtrap Lake and West Lagoon and associated soil/sediment.

In 1990, Terra-Mar conducted another environmental investigation in the Fishtrap Lake area on behalf of the City of Dallas. This investigation was generated by the discovery of contaminated fill east of Fishtrap Lake, encountered during a geotechnical project for a proposed spillway structure. Soil and groundwater samples were collected and analyzed for VOCs, TPH, and asbestos. Terra-Mar concluded that no groundwater contamination had occurred based on VOC analyses of groundwater samples; and soil/fill samples were contaminated with VOCs (benzene 73 µg/l, toluene 20 µg/l, carbon disulfide 248 µg/l, trichloroethylene, 133 µg/l, and acetone 721 µg/l) and TPH, and contained approximately 35% chrysotile asbestos.

In 1991, the EPA and TNRCC conducted environmental investigations at the RSR Corporation site. The EPA's investigation included sampling at several high risk (HR) locations, composite samples from a grid consisting of 200 foot by 200-foot blocks, and samples along three transects at the DHA site. The TNRCC's investigation included soil and material from the RSR smelter and surrounding residences other than the DHA site.

CDM conducted a site investigation of the DHA site in the fall of 1991 through the spring of 1992. The results of this investigation are detailed in a Status Report dated July 1992. CDM used these data in the development of a site-specific FS and BRA.

The City of Dallas has set up air monitoring stations in the Dallas area to evaluate contamination from lead, volatile compounds, and particulates. These stations have been in operation since 1983 and include several monitoring stations within the RSR Corporation site and one station on the DHA site. Four Hi-vol samplers are on top of the Boys and Girls Club operated 24 hours a day 7 days a week. An additional Hi-vol sampler is located north west of the DHA site at Amelia Earhart school on Bickers Street.

The Carter & Burgess and Terra-Mar investigations (Fishtrap Lake and West Lagoon) along with the EPA's 1991 study, the 1991/1992 CDM study, and the City of Dallas' air monitoring, are summarized below.

Fishtrap Lake and West Lagoon Studies

Investigations of Fishtrap Lake and West Lagoon were conducted by Carter & Burgess (1985) and Terra-Mar, Inc. (1987). These investigations included sampling/analysis of sediments, surface water, and fish from both Fishtrap Lake and West Lagoon. Several parameters were measured such as fecal coliform, dissolved oxygen, biological oxygen demand, phenols, oil and grease, and metals (i.e., lead, cadmium, chromium, copper, mercury, nickel, and zinc). The Terra-Mar study analyzed both sediment and water samples from Fishtrap Lake and West Lagoon by EP Toxicity testing for arsenic. The Carter & Burgess study did not include analyses for arsenic.

Three water samples were collected from Fishtrap Lake and one from West Lagoon. All four of these samples were analyzed for total lead and one sample from both Fishtrap Lake and West Lagoon was analyzed for a whole suite of parameters, including lead, zinc, nickel, cadmium, copper, chromium, mercury, oil and grease, PCBs, phenols, COD, fecal coliform, and BOD. Arsenic was not included. The lead content of the water ranged from 0.001 to 0.009 mg/l. These data did not indicate contamination of the surface water by lead.

In the Carter & Burgess study, all sediment samples were analyzed for total lead, while priority pollutant metals were analyzed in one sample from both the lagoon and the lake. The metals analyzed in the Carter and Burgess study were: lead, zinc, nickel, cadmium, copper, chromium and mercury. Sediment samples were taken from 10 locations in the lake and one location of the

lagoon. At each location, samples were taken from various depths within the bottom sediments (0 to 6, 8 to 12, and 20 to 24 inches). Lead content in these samples ranged from 12.1 to 1490 mg/kg. The highest lead content was observed in sample SE from the 0 to 6 inch depth of Fishtrap Lake. However, lead values above 500 mg/kg were detected in the lake sediments at the 12- and 24-inch depths.

Fish from Fishtrap Lake were also analyzed by Carter & Burgess. The following table presents the results from the fish tissue sampling and analysis:

Fish Tissue	Lead Conc. (mg/kg)
Bluegill #1	0.078
Bluegill #2	0.076
Brown Bullhead	0.100
Gizzard Shad	0.097
Warmouth	0.070

It is reported by Carter & Burgess (1985) that the reported lead values are the detection limits. Furthermore, Carter & Burgess (1985) report that lead in market canned fish ranges from 0.28 to 0.78 mg/kg (Ewing, 1979); therefore, (Carter & Burgess) the lead concentrations in fish in Fishtrap Lake do not pose a hazard to humans or other fish consumers.

The Terra-Mar study included sampling of surface water and sediments from Fishtrap Lake and West Lagoon. In the Terra-Mar study, two water samples were collected and five sediment sample locations were selected for multiple samples from West Lagoon. Two water samples were collected and 24 sediment sample locations were selected for multiple samples from Fishtrap Lake. Fifty-eight total sediment samples from both sources were analyzed. These samples were analyzed for nine metals and 53 organic compounds. The results of these samples differ from those of the Carter & Burgess study as a result of different analytical procedures. Metal concentrations in sediments and water samples collected by Terra-Mar were analyzed for metals using the Exposure Toxicity or EP TOX test (EPA Method 1310). The results of the Terra-Mar study indicated that lead content was below the analytical detection limit of 0.05 mg/l in all 29 samples in the lake and lagoon using the EP TOX method. The EP TOX test is designed to determine waste classification as RCRA hazardous or non-hazardous and not as an indicator of site contamination. [Note: EP Tox has since been replaced by the Toxicity Characteristic Leaching Procedure (TCLP).]

EPA Investigation (1991)

The EPA performed site investigations of the RSR smelter and surrounding area (RSR Corporation site) as well as the DHA site. The EPA's recent involvement in the RSR Corporation site resulted from a request from the TNRCC following complaints by area residents. The RSR Corporation site is designated by the EPA as Site No. TXD079348397.

The EPA's soil sampling of the DHA site over the years has included three transects; blocks formed by a 200-foot grid in George Loving Place; playground areas in George Loving Place and Edgar Ward Place; and 16 HR sampling locations. The transects consisted of three to seven sampling points across areas in George Loving Place. The transects were oriented in several different directions and sampling points spaced at approximately 400 feet. The grid set up by the EPA over the DHA site consisted of a total of ninety 200 foot by 200 foot sampling blocks (200 foot blocks). Ten random soil samples were collected from the 0 to 1 inch and 0 to 3 inch depths and composited from each block and analyzed for total lead, arsenic, and cadmium. Soil sampling in the 16 HR locations at the DHA site was conducted in 25 foot by 25 foot blocks. High risk locations are areas in which the risk of contaminant exposure is high and included locations such as playgrounds, public schools, day-care centers, and parks. Composite soil samples (consisting of four grab samples) were collected from these locations from the 0 to 1 inch and 0 to 3 inch depths. Soil samples collected by the EPA were analyzed for total lead, arsenic, and cadmium by EPA Method 6010 (inductively coupled plasma or ICP).

CDM's review of the EPA's sampling results indicated that elevated concentrations of lead (i.e., 500 mg/kg or greater) and arsenic (i.e., 20 mg/kg or greater) were present in George Loving Place, as discussed below. The highest observed concentration of cadmium in the soil was 16 mg/kg.

Based on the EPA's sampling results, CDM concluded that soil with elevated levels of lead were located primarily south of Bickers Street and west of Rupert Street except for the isolated case of location HR-15 in Kingbridge Park. Soil lead content in the 200 foot sampling blocks in George Loving Place ranged from 40 to 2490 mg/kg. Twenty-seven of the ninety 200 foot blocks had a soil lead content of 500 mg/kg or greater. Soil lead content in the three transects ranged from below the analytical detection limit of 1.0 mg/kg to 1,520 mg/kg. Lead content in soils from HR locations ranged from below 1.0 to 1,470 mg/kg (at HR-15). Lead content in the playground soil samples ranged from less than 1.0 to 464 mg/kg.

As a result of the 1,470 mg/kg lead content in the soil at location HR-15, the EPA's Emergency Response Branch excavated a 25 foot by 25 foot area to a depth of approximately 18 inches. CDM estimated that the volume of soil excavated from this area in Kingbridge Park was 35 cubic yards of in-situ soil excavation. Analytical results collected by Riedel Peterson Environmental Services (contractor for the EPA in West Dallas) indicated that the soil

excavated from location HR-15 was nonhazardous (TCLP value for lead and arsenic content was 0.56 mg/l and less than 0.005 mg/l, respectively).

Soil arsenic content in the 200 foot blocks in George Loving Place ranged from below the analytical detection limit (0.1 mg/kg) to 62 mg/kg. Soil arsenic content was 20 mg/kg or greater in 21 of the 90 sampling blocks. All but nine of these blocks are also indicated as having a lead content above 500 mg/kg. Arsenic content in samples from the three transects ranged from below the detection limit to 33 mg/kg. Arsenic was below 20 mg/kg in all soil samples from HR locations. Arsenic content of the playground soil samples was less than 12 mg/kg, except at one location, PGL-13 (28 mg/kg).

In conclusion, EPA's sampling results indicated that thirty-six of the ninety, 200 foot blocks in George Loving Place had concentrations of lead above 500 mg/kg and/or arsenic above 20 mg/kg in the soil.

CDM Site Investigation

CDM's Status Report dated March 26, 1992 details site investigation activities conducted at the DHA site during the fall of 1991 through the spring of 1992. The report includes project objectives, a review of site history, site investigation methods, and investigation results. Environmental samples were collected and evaluated from surface soils, soils beneath building foundations, subsurface soils, indoor building dust, groundwater, and tap water. A brief review of this investigation is provided below. The CDM Status Report contains additional details regarding sample collection, preparation, and analysis.

Surface Soil Sampling

CDM collected a total of 830 composite soil samples at the DHA site along a 300 foot grid (166 sampling locations). [NOTE: The EPA collected soil samples within the blocks formed by a 200 foot grid rather than the nodes of the grid as done by CDM.] Metal content of soil samples was determined by XRF spectrometry utilizing the Spectratrace model TX-5000. Prior to analysis, samples were prepared by sieving, grinding, and splitting to optimize XRF results.

Soil samples were collected at five depths (0 to 1 inch, 1 to 2 inches, 2 to 6 inches, 6 to 12 inches and 12 to 18 inches) at each sampling location. Each sampling location consisted of three separate excavations to a depth of approximately two feet within a one meter distance. Other than Jose Navarro Elementary School, adjacent DISD properties were not included in the sampling plan due to access limitations and schedule. DHA owns the property where Jose Navarro Elementary School is located and leases it to DISD. All other schools are located on DISD property. The EPA had previously conducted removal actions on several DISD properties in the area including Amelia Earhart, Carver Learning Center, and Thomas A. Edison Middle School with elevated concentrations of soil lead and/or arsenic. The elevated lead concentration found at the EPA HR-15 sampling location (on

9/05/91) was 1470 ppm total lead in the 0-3 inch interval. Remedial action by EPA (December of 1991) included excavation to a depth of 18 inches, followed by lining the excavation and backfilling with clean fill followed by sodding the area.

Soil samples were analyzed by XRF for calcium, manganese, iron, copper, arsenic, lead, nickel, zinc, and cadmium. Since the EPA identified lead, arsenic, and cadmium as contaminants of concern (for removal purposes) at the RSR Corporation site, these three elements were emphasized in the site investigation of the DHA site. COCs for the remedial action will be identified based on the RI. The XRF equipment was calibrated with 10 soils from the DHA site utilizing lead values determined from CLP-type analysis. In addition to the calibration samples, a total of 53 split samples were sent to the CLP laboratory for analysis of lead by EPA Method 7421. The correlation coefficient (r) between XRF lead values and that obtained from a CLP laboratory was 0.95. The data indicated the high quality of the XRF data.

The XRF analyzer was calibrated for other metals besides lead. In particular the XRF equipment (Spectrace 5000) was calibrated from arsenic, cadmium, calcium, copper, iron, lead, manganese, nickel and zinc using ten samples from the DHA site. Site specific samples were used to calibrate the XRF analyzer to enable correction for matrix effects. The 10 samples were selected to cover the range of concentrations observed at the DHA site; essentially these samples are the same as site-specific standards.

The 10 calibration samples were analyzed by method 6010 for metals and method 7060 for arsenic. Five of the samples were also analyzed by method 7131 for cadmium and one sample by method 7421 for lead to achieve lower detection limits. QA/QC samples were analyzed every 16 samples to ensure calibration was unchanged.

Review of the XRF data indicated that lead, arsenic, and cadmium were present at the DHA site at highly variable concentrations. Total soil lead content ranged from as low as 2 mg/kg to as high as 5,400 mg/kg. Total arsenic content in the soil ranged from below the analytical detection limit of 5 mg/kg to 28 mg/kg. Total cadmium content of the soil was no greater than 16 mg/kg at the DHA site except at location PG-191 (12 to 18 inch depth). Cadmium content at this location and depth was 112 mg/kg.

Determination of soil "contamination" was, in part, on the basis of levels suggested by the Agency for Toxic Substances and Disease Registry (ATSDR). The action levels recommended by CDM for the three removal action COCs at the DHA site are as follows:

- Total lead - 500 mg/kg;
- Total arsenic - 20 mg/kg; and
- Total cadmium - 30 mg/kg.

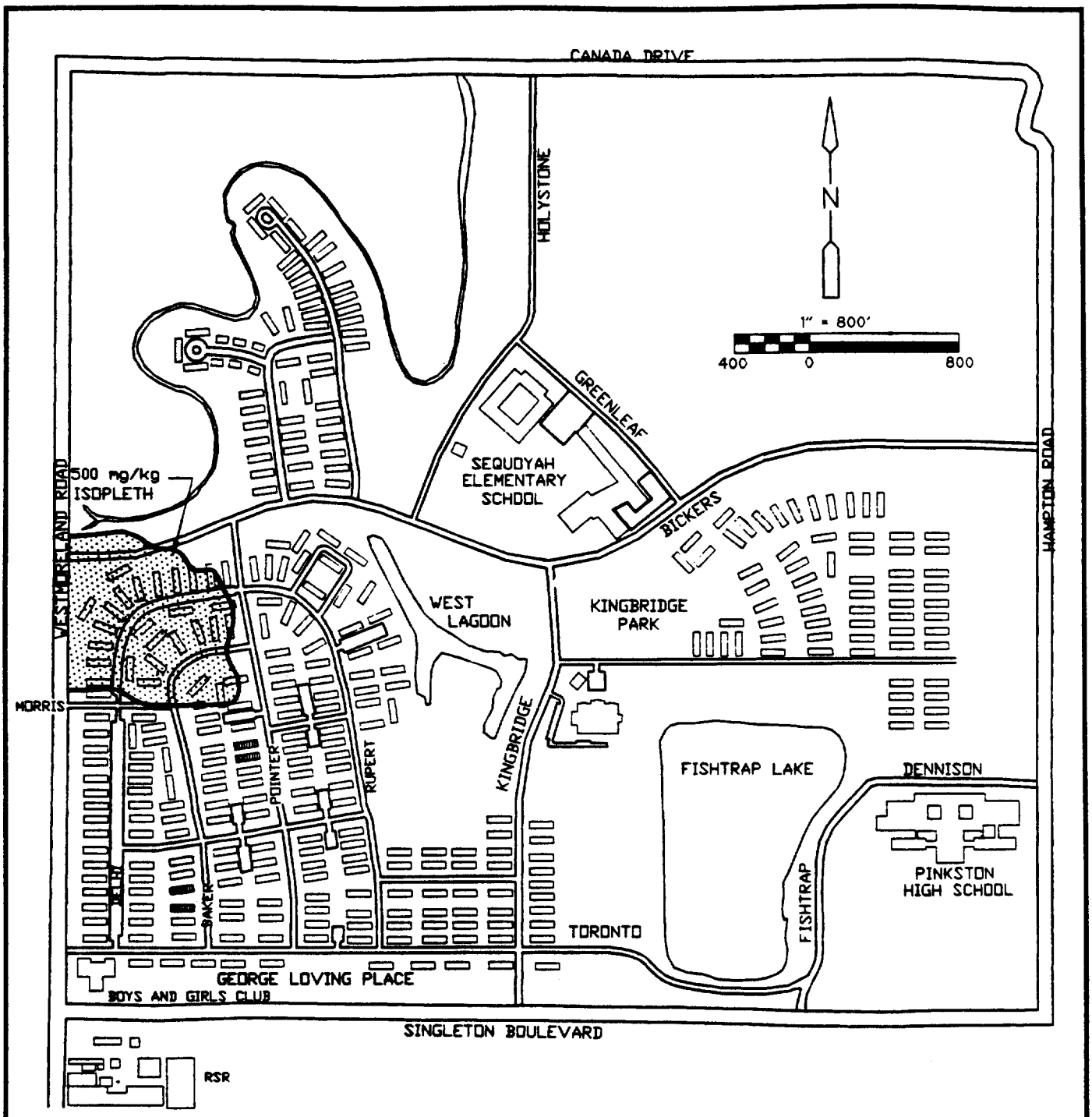
Remedial action goals may also be utilized to determine contamination and subsequent cleanup at the site. Remedial goals are established from applicable or relevant and appropriate requirements (ARARs) and from a site-specific BRA. [Note: Remedial action goals for arsenic at CERCLA sites ranged up to 70 mg/kg in the Record of Decisions (RODs) reviewed by CDM for similar sites. The EPA's Emergency Response Branch has used a cleanup level for arsenic of 20 mg/kg for surface soils (0 to 6 inch depth) and 50 mg/kg for soils below the 6-inch depth at the RSR Corporation site.]

The data from CDM's site investigation were entered into a geostatistical and plotting program (GeoEAS) to develop contours of various lead concentrations (i.e., isopleths) across the entire DHA site. Isopleths were developed for the average 500 mg/kg soil lead concentration (Figure 2-2) as well as the 99 percent (three standard deviations) values.

The geostatistical data indicated that lead content of the soil was generally highest on the west side of the DHA site along Westmoreland Road and Bickers Street and decreased moving to the east. This area of the DHA site is known as George Loving Place. Lead concentrations in the soil (0 to 1 and 1 to 2 inch depths) were well below 500 mg/kg east of Pointer Avenue (north of Bickers Street), and east of Kingbridge Street (south of Bickers Street). [Note: Soil contamination from lead in Kingbridge Park, east of Kingbridge Street, was limited to below the 2 inch depth.] Soil samples collected west of Pointer Avenue to the north of Bickers street had higher lead concentrations. Except for the Kingbridge Park area, lead concentrations were highest in the 0 to 1, and 1 to 2 inch depth intervals and decreased with increasing depth in the soil profile. Neither smelter slag nor battery chips were observed at any of the sampling points at the DHA site.

The geostatistical data indicated that elevated lead concentrations were present in isolated areas of Kingbridge Park. Due to the high spatial variability of lead content, the isopleths were not utilized in this area. Instead, dot plots of lead content were associated with each sampling location. Based on historical aerial photographs, open-pit gravel mining was conducted in the Kingbridge Park area. Evidence also exists suggesting that waste disposal occurred in these pits. The distribution of soil lead concentrations in Kingbridge Park appears to be related to open pit dumping. The fill debris, which consisted of a mixture of decomposed organic materials, glass, porcelain plates, and metals, was sampled and analyzed for lead. Lead concentrations in the fill in the Kingbridge Park area were as high as 5,400 mg/kg. The higher lead concentrations were detected in the 6 to 12 and 12 to 18 inch depth intervals. Soil lead content at locations PG-210 and SG-011 (both locations are west of Kingbridge Street) had elevated levels of lead in the 0 to 1 and 1 to 2 inch depths.

The areal extent of soil contamination within George Loving Place was estimated from the average 500 mg/kg isopleth. This area was determined as 721,000 square feet. A higher confidence level for identifying contaminated soil can be obtained by utilizing the 99 percent isopleth. The areas of soil within this isopleth were estimated at 2,500,000 square feet. Utilizing a higher



RI / FS WORK PLAN

EXTENT OF SOIL LEAD CONTAMINATION

DALLAS HOUSING AUTHORITY
DALLAS, TEXAS

Figure No. 2-2

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confidence level than that formed by 99 percent isopleth (three confidence intervals) is neither cost effective nor practical for this site.

Soil Beneath Building Foundations

Soil samples were collected from beneath building foundations at the DHA site to evaluate the lead content of these soils. Analytical data from these samples were used to evaluate future cleanup, since buildings will be demolished and removed from the property.

Five buildings located within George Loving Place were identified for sampling (two sample locations for each building for a total of 10 sampling locations). These locations (as shown in Figure 1-10 in CDM's FS) were chosen due to their close proximity to the RSR Corporation smelter and elevated lead concentrations observed in the adjacent soils. Samples were taken from five depth intervals at each sampling location (i.e., 0 to 1, 1 to 2, 2 to 6, 6 to 12, and 12 to 18 inches).

Lead concentrations in the soils beneath the building foundations were below 500 mg/kg in all 50 of the samples tested. The 50 samples were laboratory-analyzed for lead by ICP method. Only one of the soil samples had a lead concentration approaching 500 mg/kg. Sample BF-06 (12 to 18 inch depth) from building number 3233 to 3245 Delhi Street had a total lead content of 459 mg/kg.

Subsurface Soil

Eleven soil borings were drilled at the DHA site during the site investigation to evaluate general subsurface conditions and potential contamination. Soil borings were located in areas identified from historical aerial photographs as having been previously excavated. The total depth of the borings ranged from 12 to 22 feet, depending on the depth to the Eagle Ford shale (i.e., underlying confining layer).

Fill was encountered at several locations across the DHA site. The fill in most cases included materials generally associated with municipal wastes such as clothing, glass, wood, metal, and bottles as well as decomposed organic materials. No battery chips were observed, as indicated by field notes. No smelter slag was observed in the 45 soil samples collected from these soil borings.

Based on visual observation for slag and field screening with an organic vapor monitor for volatile compounds, 13 soil samples were collected from just below the surface to a depth of 14 feet for analysis. The total lead in these samples ranged from 4.6 to 1,980 mg/kg. The highest lead concentration was present at soil boring SB-8, which is in an open space southwest of the Greenleaf Street/Applegrove Street intersection and approximately 200 feet south of the playground on Greenleaf. This sample was taken from a soil depth of 13 to 14 feet. All other soil samples had lead concentrations well below the 500 mg/kg action level.

Dust Sampling

A total of 31 dust samples were collected from the floors of the apartment units at the DHA site during the site investigation. Twelve of the samples were collected from unoccupied apartments. The remaining 19 samples were collected from apartments currently housing residents. Occupied apartments included units in George Loving Place, Edgar Ward Place, and Elmer Scott Place. Unoccupied apartments were limited to units in George Loving Place, west of Pointer Avenue.

Total lead content of the indoor dust in occupied units ranged from 125 to 191 mg/kg (mean of 141 mg/kg). Total lead content of dust in unoccupied units ranged from 188 to 4,489 mg/kg (mean of 1,748 mg/kg). Eight of the 12 units sampled in unoccupied units (67 percent) had a dust lead content of greater than 500 mg/kg (see Table 1-1 in the FS).

Groundwater

General groundwater quality and potential contamination from metals, volatile organic compounds (VOCs) and base, neutral, acid extractable compounds (BNAs) were evaluated from samples collected from four monitor wells installed at the DHA site. Three of the monitor wells are located in Kingbridge Park in areas of suspected fill. One other well (MW-04) is located just behind the George Loving Place maintenance facility on Rupert Street. This monitor well was installed to evaluate background groundwater quality. All four of these wells are screened in the uppermost water-bearing formation at the DHA site.

Four wells were surveyed by CDM on April 30, 1992. Based on survey data, groundwater flow direction appears to be north to northwest. The "background well" in George Loving Place (MW-04) does appear to be upgradient of Kingbridge Park. No waste fill material was encountered during installation of MW-04, and groundwater analyses were below detection levels except for arsenic and barium detected at 0.003 mg/l and 0.03 mg/l, respectively. The arsenic and barium concentrations were detected in all site monitor wells from 0.003 mg/l to 0.02 mg/l and 0.03 mg/l to 0.59 mg/l, respectively. The Maximum Contaminant Level (MCL) for arsenic in groundwater is 0.05 mg/l the MCL for barium in groundwater is 1 mg/l, and the MCL for lead is 0.015 mg/l.

Groundwater samples, both filtered and unfiltered, collected during the RI will be analyzed for metals. All water samples collected during the RI will be analyzed by methods yielding the detection limit of 0.001 mg/l to 0.002 mg/l. The groundwater samples collected in February 1992 were analyzed by the laboratory for lead using a method giving a detection limit of 0.02 mg/l . This method detection limit was acceptable at the time because the action value of 0.015 mg/l was not finalized until 1993.

City of Dallas Air Monitoring

Potential sources of air emissions in the West Dallas area have included the RSR Corporation smelter as well as GAF industries (VOCs and odor), Dallas Steel Drum (VOCs), and Liberty Metals (particulate emissions). All of these industries are located south of the DHA site and as a result of prevailing wind direction from the south/southeast could potentially have an impact on the air quality of DHA residents. Ambient air monitoring stations have been operated at the DHA site and surrounding community over the last nine years by the City of Dallas to sample for lead. Monitoring stations are located at 3004 North Westmoreland (Boys and Girls Club) and 3434 Bickers Avenue (Amelia Earhart Elementary School).

Data collected from the monitors from 1983 to the present time indicated the following:

- One violation for lead in excess of the 1.5 µg/cubic meter regulatory limit occurred in 1983 while the RSR smelter was in operation;
- When the RSR smelter was closed in 1984, the sampling sites south, southwest, and west of the smelter were discontinued;
- No violations have occurred at the remaining monitoring sites since 1983;
- Monthly lead averages for the Westmoreland Road Station (No. 57) for 1992 ranged from 0.1 to 0.3 µg/cubic meter (maximum concentrations of 1.9 µg/cubic meter); and
- Monthly lead averages for the Bickers Avenue station (No. 61) for 1992 ranged from 0.0 to 0.1 µg/cubic meter (maximum concentration of 0.1 µg/cubic meter).

3 Section Three

Section 3
Sampling and Analysis Rationale

Data Quality Objectives

DQOs are qualitative and quantitative statements specified to ensure that data of known and appropriate quality to support decisions are collected. DQOs are an integrated set of thought processes which define data quality requirements based on identified end uses of the database. The DQO summary (Table 3-1) presents the overall study objectives and intended data uses for each media/matrix type. Also included in the summary are the analytical levels appropriate to achieve the study objectives; the data required to complete the RI; and the contaminants of concern for each specific media. Table 3-2 explains the analytical support levels for data collection activities referenced in Table 3-1.

The DQOs compiled in Table 3-1 are based on the following:

- DQOs established for similar sites (i.e., review of RODs).
- Evaluation of anticipated data gaps based on review of historical site data and CDM's site investigation.
- Formulation of contaminant source areas and types and likely contaminant migration pathways.
- Identification of a concise set of objectives for the RI.

The primary objectives of the RI/FS conducted at the DHA site are as follows:

- Characterize the physical and chemical nature of the contaminants of concern.
- Determine the extent of contamination in the various media.
- Identify the migration pathways for these contaminants in the soil, groundwater, surface water, and sediments.
- Determine the fate of the contaminants in the environment, focusing on potential impacts to human health and the environment.
- Perform appropriate risk assessments based on site investigation results.

Table 3-1

Data Quality Objectives Summary

RI/FS Workplan

Dallas Housing Authority

Activity	Ground Water Investigation	Subsurface Soil Investigation	Surface Water Investigation
Overall study objectives and data uses	Evaluate potential contamination; identify migration pathways, and groundwater users; evaluate treatment needs/ alternatives; evaluate contaminant sources	Determine extent of contamination of soils; evaluate contaminant sources in landfill area;; incorporate data from S.I.	Evaluate surface water hydrology. Determine the impact of the site on surface water contamination. Evaluate contaminant sources and treatment needs/alternatives.
		Provide data for remedial alternative evaluation and risk assessment.	Provide data for qualitative ecological risk assessment, if necessary.
Appropriate Analytical Levels	RI/FS: I, III, IV, V - Risk Assessment: III, IV, V	RI/FS: I, III, IV, V - Risk Assessment: III, IV, V	RI/FS: I, III, IV, V - Risk Assessment: III, IV, V
Data Needs	Extent of contamination with target parameters.	Extent of subsurface contamination with target parameters	Extent of surface water contamination.
	Well installation logs to characterize geology and hydrogeology.	Physical characteristics to assess potential for continued contaminant migration.	General water quality data (TDS, TSS, pH, EC, etc.)
	TOC, pH, and EC	TOC and texture	TDS, TSS, TOC, pH, specific conductivity, DO, temperature.
Contaminants of Concern	Lead, arsenic, and cadmium (Total)	Lead, arsnic, and cadmium (Total)	Lead, arsenic, and cadmium (Total)
	VOCs (TCL) (10%)	VOCs (TCL) (10%)	VOCs (TCL) (10%)
	BNAs (TCL) (10%)	BNAs (TCL) (10%)	BNAs (TCL)(10%)
	Metals (TAL) (10%)	Metals (TAL) (10%)	Metals (TAL) (10%)
Detection Limit Requirements	See QAPP	See QAPP	See QAPP

Table 3-1

Data Quality Objectives Summary (Continued)

RI/FS Workplan

Dallas Housing Authority

Activity	Sediment Investigation
Overall Study Objectives and Data Uses	Determine the extent of contamination. Provide data for qualitative ecological risk assessment, if necessary.
Appropriate Analytical Levels	RI/FS: I, III, I V, V - Risk Assessment: III, IV, V
Data Needs	Extent of contamination of sediment with target parameters
Contaminants	Metals (TAL)
	Halogenated and Aromatic Volatile Organics
	Base Natural and Acid Extractables
Detection Limit Requirements	QAPP

Table 3-2

EPA Analytical Support Levels for Data Collection Activities

Dallas Housing Authority

The analytical options available to support data collection activities are presented in five general levels (EPA DQO Guidance). These levels are distinguished by the types of technology and documentation used, and their degree of sophistication		
Level V	**Nonstandard Methods:**	Analyses which may require method modification and/or development. CLP Special Analytical Services (SAS) are considered Level V.
Level IV	**CLP Routine Analytical Services (RAS):**	This level is characterized by rigorous (QA/QC) protocol and documentation and provides qualitative and quantitative analytical data. Some regions have obtained support via their own regional laboratories, university laboratories, or other commercial laboratories.
Level III	**Laboratory Analysis Using Methods Other than the CLP RAS:**	This level is used primarily in support of engineering studies using standard EPA approved procedures. Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.
Level II	**Field Analysis:**	This level is characterized by the use of portable analytical instruments which can be used onsite or in mobile laboratories stationed near a site (close-support labs). Depending upon the types of contaminants, sample matrix, and personnel skills, qualitative and quantitative data can be obtained.
Level I	**Field Screening:**	This level is characterized by the use of portable instruments which can provide real-time data to assist in the optimization of sampling point locations and for health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations.

- Aid in development and evaluation of potential technologies for remediation of the site.

The establishment of DQOs occurs during the initial stages of the project planning in order to focus the sampling and analysis activities. Since DQO development is an on-going process, they will be periodically reviewed and refined throughout the RI/FS process.

Sampling Program Design and Rationale

The sampling program which has been developed for this RI/FS will be performed in three phases. Those phases include performing:

- Analyses on archived surface and subsurface soil samples;
- Surface geophysical surveys; and
- Intrusive sampling of soil, sediments, groundwater and surface waters.

The sampling program has been designed to identify the contaminants of concern for each media and delineate the impacted areas. The results of this sampling effort will be used to conduct a risk assessment and identify additional portions of the site that require remedial action.

The archived samples will be analyzed site wide for arsenic and cadmium to further characterize impacts to the surface and shallow subsurface soils from the RSR lead smelter activities. Select archived samples will also be analyzed for the Target Analyte List (TAL) metals as a means of determining whether other potential contaminants of concern are present on-site above a depth of 18-inches below ground surface. Those analyses will be augmented by additional analyses performed in association with the demolition and soil removal activities. The intrusive sampling program delineated in this workplan may be revised based on the analytical testing results from the archived samples.

Surface geophysical surveys, conducted using an EM-31, will be performed prior to conducting the intrusive sampling to help focus investigative efforts used to characterize the fill areas in the central portion of the site. Transect across the filled area west of Fishtrap Lake, the landfill area north of Navarro Elementary School and in the vicinity of the West Lagoon will identify subsurface anomalies and determine the extent of non-native materials. Monitoring wells and soil borings installed during the intrusive sampling program will be sited based upon the results of the geophysical surveys, as well as information acquired by previous investigators.

Finally, the intrusive sampling program will be conducted to determine the nature and extent of contamination at the DHA site. The intrusive sampling program will involve collecting samples from the soil, sediments, groundwater

and surface water, and submitting the samples to an analytical laboratory for quantification of metals, volatile organic compounds, base neutral and acid extractable compounds, and conventional parameters. All samples collected will be analyzed for metals content, whereas select samples will be analyzed for the full suite of Target Analyte List (TAL) and Target Compound List (TCL) parameters.

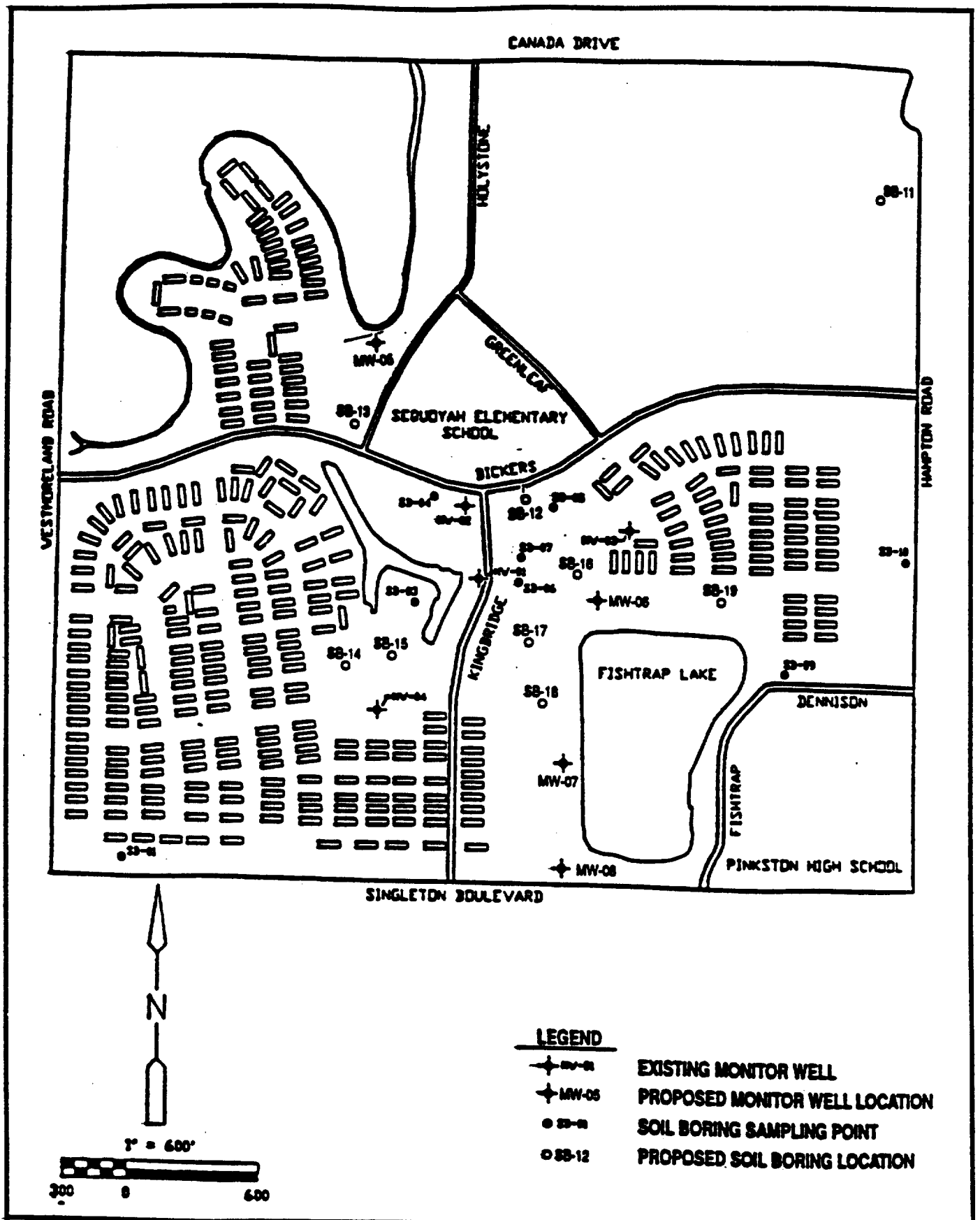
The proposed eight soil boring locations have been tentatively located based on aerial photos and previous investigations to characterize areas outside of the soil removal and grid sampling areas (Figure 3-1). Previous investigations indicate that old gravel mining excavations in the Kingbridge Park and Fishtrap Lake areas were used for waste disposal. CDM will conduct a geophysical survey using an EM-31 ground conductivity meter to determine the approximate boundaries of these fill areas. The exact locations of the soil borings will be determined based on the survey results. The purpose of the borings is to delineate the fill areas and to characterize the fill material itself. It is estimated that eight borings will be sufficient; however, survey results may warrant additional borings to delineate fill areas.

The four new proposed monitoring wells have been located strategically to augment the existing configuration of monitoring wells (Figure 3-1). Groundwater samples collected from the eight monitor wells will be analyzed in order to further characterize groundwater quality. These samples will aid in determining if contaminated soils identified by Terra-Mar have impacted the groundwater. Groundwater samples for TAL analyses will be both filtered and unfiltered.

An upgradient well (MW-08) will be installed to determine background groundwater quality, where as monitoring wells MW-05, MW-06, and MW-07 have been placed immediately adjacent to or downgradient of suspected or potential source areas. MW-07 has been placed within the area of the contaminated soils identified by Terra-Mar in 1988 in order to confirm Terra-Mar's fundings. MW-06 has been placed immediately downgradient of the suspected landfill area. MW-05 is downgradient of these two locations adjacent to the potential receptor - the West Fork of the Trinity River. If groundwater contamination is indicated, all new and existing monitoring wells will be tested to determine in situ hydraulic characteristics of the uppermost water bearing zone. Locations may change based on geophysical survey results and soil boring results.

Soils collected during both the boring and monitoring well installations will be retained for laboratory analysis. Groundwater samples collected from both the new and existing monitoring wells will also be retained for laboratory analyses.

Surface water and co-located sediment samples will be collected at seven strategic locations to determine surface water quality and sediment contaminant concentrations (Figure 3-2). Three co-located samples will be collected within Fishtrap Lake and one in the drainage ditch which connects Fishtrap Lake with the West Fork of the Trinity River. Three samples will also



REMEDIAL INVESTIGATION
DALLAS HOUSING AUTHORITY

CDM
environmental engineers, scientists planners, & management consultants

Monitor Well and Soil Boring Locations

DALLAS, TEXAS

Figure No. 3-1

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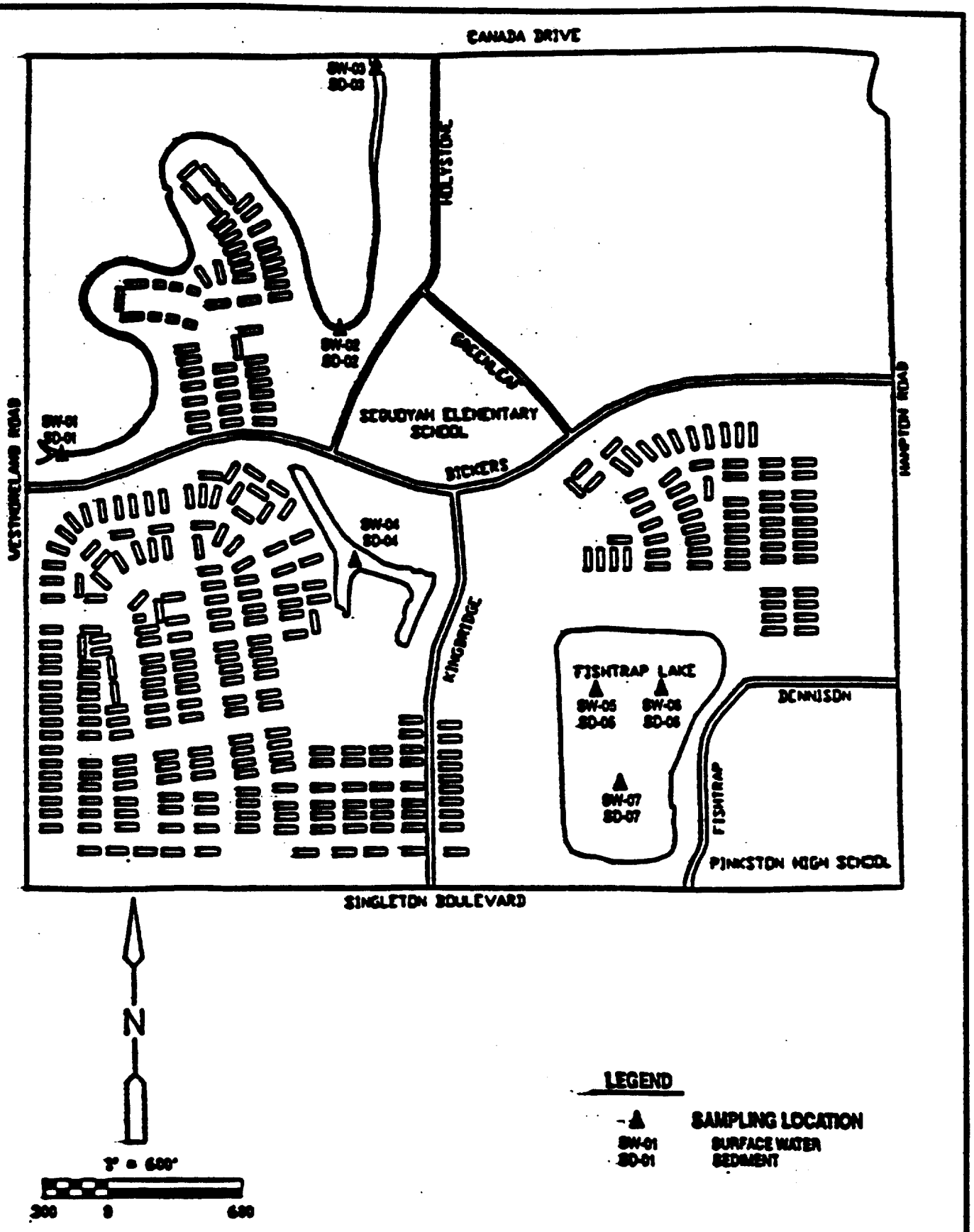

REMEDIAL INVESTIGATION
DALLAS HOUSING AUTHORITY
Proposed Surface Water/Sediment Sampling Locations
DALLAS, TEXAS

CDM
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Figure No. 3-2

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be collected in the West Fork of the Trinity River at upstream and downstream locations, as well as the confluence of the Fishtrap Lake drainage ditch.

Details associated with the sample collection methods and analytical schedule are presented in the Field Sampling Plan (FSP). Details of the quality assurance and quality control protocol for all three phases of the RI are presented in the Quality Assurance Project Plan (QAPP).

4

Section Four

Section 4
RI/FS Tasks

Performing the RI/FS will consist of completing the following tasks:

- Development of Scoping Documents
- Performance of Remedial Investigations
- Development of the Baseline Risk Assessment
- Performance of Treatability Studies, if necessary
- Development of the Feasibility Study

Each of these tasks will be completed following EPA guidance and in accordance with "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988).

This section details each task and describes the deliverables and review requirements associated with each.

Project Planning/Scoping Documents

CDM will prepare for DHA the appropriate scoping documents, of which this workplan is one. The scoping documents include:

- RI/FS Workplan
- Field Sampling Plan
- Quality Assurance Project Plan
- Health and Safety Plan

The RI/FS Workplan includes a site background summary and a detailed description of the tasks to be conducted during the RI/FS activities. The RI/FS Workplan also includes an overview of the methodologies; information to be developed; and the deliverables for the activities conducted pursuant to this RI/FS, as well as the corresponding schedules for completion of those activities.

The Sampling and Analysis Plan (SAP) consists of a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The FSP will define in detail the sampling and data gathering activities, objectives, information to be gathered, and the locations and frequencies of sampling. The QAPP will describe the project objectives and organization including a listing of the personnel responsible for project execution, functional activities; quality assurance and quality control protocols; sampling procedures; sample custody; analytical procedures and detection levels; and data reduction, validation, and reporting.

The RI/FS Workplan and SAP will be reviewed and approved by EPA prior to the conduct of any field investigations.

The Site Health and Safety Plan (HSP) will be prepared in accordance with the Occupational Safety and Health Administration (OSHA) regulations applicable to Hazardous Waste Operations and Emergency Response, 29 CFR Part 1910. EPA will review the Site Health and Safety Plan for compliance, but will not approve the plan. EPA may, at its discretion, disapprove the Site Health and Safety Plan and provide comments concerning those aspects of the plan which pertain to the protection of the environment and the health of persons not employed by, or under contract to, CDM.

EPA will prepare a community relations plan, in accordance with EPA guidance and the NCP, and will provide a copy of same to DHA for review and comment. DHA will provide information concerning activities conducted pursuant to the existing Consent Order, upon request from EPA, to support EPA's community relations programs. Any press releases or documents prepared for public review by Respondent shall include the statement: "The Dallas Housing Authority is a separate entity from the United States Environmental Protection Agency. Views and opinions expressed by the Dallas Housing Authority do not necessarily reflect Environmental Protection Agency policy."

Remedial Investigation

The remedial investigations will consist of:

- Performing field investigations;
- Validating and organizing laboratory data;
- Conducting data analyses and evaluations; and
- Preparing the RI report.

Field Investigations

As discussed earlier, the field investigations will involve three phases of activities. The initial phase will involve conducting laboratory analyses on previously collected soil samples for arsenic and cadmium content. The second phase will involve conducting shallow geophysical surveys in the fill areas throughout the central portion of the site. The final phase will include the following:

- Intrusive sampling of various media including soil, sediments, groundwater and surface water;
- Hydraulic testing of the existing and newly installed monitor wells;
- Review of City of Dallas air quality sampling results; and
- Inventory of area water wells within a 1 mile radius of the site.

Data Validation and Organization

Upon completion of the field investigations, laboratory analyses will be validated and organized. The purpose of the data validation review is to ensure that rigorous laboratory quality control criteria have been met and that data are of legally defensible quality. All laboratory analyses will be generated with a corresponding CLP Level IV QA/QC data package. This will enable any sample to undergo validation necessary.

Upon completion of laboratory analyses, analytical data will be reviewed. CDM will validate a portion of the data by EPA protocol. CDM will consult with EPA to determine data to be validated. The data validation review of analytical data will be performed according to documentation established and adopted by the EPA and the accuracy and precision criteria outlined in the Quality Assurance Project Plan for analysis of chemical data.

As part of the review, the reviewers are responsible for developing the QA/QC report for each analytical data package or data set. This report will summarize the results obtained for samples collected, and be submitted to the EPA as part of the required monthly progress reports.

Upon completion of the data validation process, data generated during the investigations will be entered into a computerized technical database.

Data collected previously will be reviewed and may be used during the FS. Since those data have been collected by a variety of firms and agencies using different methods and QA/QC procedures, judgment of quality must be exercised prior to incorporation into the RI/FS investigations. Unless information is available on the method of sample collection, the analytical methods employed and quality assurance/quality control procedures, the data points may be assigned a low level of confidence. These data may still be usable for a variety of other purposes.

Data Analysis

If warranted, methods of data presentation and interpretation will be used to document and evaluate the vertical and horizontal extent of the contamination, to characterize source areas, to determine contaminant migration rates, and to identify and evaluate contaminant exposure risk scenarios.

The focus of the analyses will be to determine whether contaminants detected in the soils and subsurface have migrated into the shallow water bearing zones, and if they have, whether or not their further migration poses any risk. The methods of analyses and the determination of contaminant migration will be used to identify exposure points for evaluation under the Public Health and Ecological Impact Assessments. Estimation of contaminant loading rates and fate, within the RI framework, have a direct impact on the assessment of risk, and ultimately on definition of remedial goals. This interlinking of data collection, analysis, and defining remedial objectives again points to the need for the concurrent or interactive RI/FS approach.

Human Health and Ecological Risk Assessments

Human health and ecological risk assessments will be performed for the DHA site to evaluate the extent to which chemicals at or originating from the site may adversely effect human and environmental receptors. These "baseline" risk assessments will then be used to evaluate the protectiveness of the proposed remedial alternatives and in the development of site cleanup goals. CDM has previously developed a baseline risk assessment for exposure due to lead contamination found in surface and shallow subsurface soils. Information collected during this RI/FS will be used to supplement that previous effort.

Site-specific sampling data, toxicological data on site chemicals, and information on the location and nature of potentially exposed human and environmental populations will be the basis of the risk assessment. One report will be prepared which includes both the human health and ecological risk assessments.

The following sections describe the human health and ecological risk assessments in greater detail.

Human Health Risk Assessment: The human health risk assessment will be organized into four major sections as follows:

- Data evaluation;
- Exposure assessment;
- Toxicity assessment; and
- Risk characterization.

Data Evaluation: Site data which will be used in the risk assessment will be reviewed to determine if the risk assessment data quality objectives were met. Site background data will be compared with upgradient, off-site, or published background data to the extent that appropriate, comparable data exist. Chemicals determined to be above background concentrations will be evaluated for frequency of detection and for toxicity relative to site concentration. Based on these evaluations, an appropriate list of chemicals will be selected as potential chemicals of concern. Because of the importance of this step, the first of potential chemicals of concern, along with supporting justification, will be reviewed with the EPA for concurrence prior to subsequent steps in the risk assessment. Elements of particular concern are lead, cadmium and arsenic.

Exposure Assessment: Based on the conditions at the site and the chemicals of potential concern, potentially exposed populations and exposure pathways will be identified. The most significant exposure is expected to be associated with potential ingestion of contaminated soils. Even though this may not be an actual pathway, an evaluation of a hypothetical residential scenario will typically be required. Additional pathways, however, may be of concern including exposure via non-potable use of groundwater, (e.g., irrigation), or inhalation of blowing moist soil. Exposure point concentrations will be identified or estimated from site data and exposure scenarios will be developed to represent the actual conditions of exposure at the site. Actual exposure pathways will be used to evaluate cleanup goals. The nature and potential impact of uncertainties in the exposure assessment will also be identified. Prior to conducting the risk characterization, a document will be submitted to the EPA describing the exposure scenarios and the assumption on which they are based. This step is intended to provide the EPA an opportunity to validate the assumptions and assess the degree of conservation employed. This is an extremely important step.

Toxicity Assessment: Qualitative and quantitative toxicological information on potential chemicals of concern will be reviewed and summarized. Reference Doses (RfDs), Slope Factors (SFs), or other appropriate quantitative values that can be used to evaluate toxicity will be identified. RfDs and SFs are developed based on dose/response relationships and are used to assess toxic and carcinogenic risks, respectively. Toxicity profiles will be prepared which summarize this information for each of the potential chemicals of concern, and the uncertainties in toxicity assessments will be identified.

Risk Characterization: Data from the toxicity assessment and exposure assessment is integrated during this step to estimate the carcinogenic and non-carcinogenic risks to public health from exposure to site-related chemicals. Human health risks from each chemical and each exposure pathway will be calculated and combined to obtain an overall estimate of risk to public health. Finally, a qualitative assessment and summary of the uncertainties in the entire risk assessment process will be presented.

Based on sampling data, field surveys of ecological receptor populations, and other measures of community structure and ecosystem function, the risk characterization will address:

- The nature and magnitude of ecological impacts;
- Receptor populations or habitats that are or are expected to be affected;
- The probability that an adverse effect will occur; and
- Whether the impact is expected to be transient, reversible, or permanent.

Development of Site Cleanup Goals: The selected remedial alternative should be protective of both human and environmental receptors and attain Applicable Regulations. Human health and ecological risk-based cleanup goals will be calculated based on the risk assessment and the range of risks that the EPA consider acceptable. Applicable Regulations-based cleanup goals will be determined based on the results of the Applicable Regulations analysis. In practice, however, a variety of other factors may influence the final selection of cleanup goals. These factors may include technological limitations inherent in a particular remedial alternative, background contamination issues, and DHA concerns.

RI Report

At the completion of RI activities, and in accordance with the schedule approved in the Project Plans, EPA will receive a Remedial Investigation Report which documents the activities conducted and data and information collected during the demolition, removal, and Remedial Investigation activities conducted at the site. The RI report will incorporate data collected during CDM's initial site investigation and combine this with the data collected during the RI. The RI will be prepared for EPA's review following "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (October 1988).

Feasibility Study

The "formal" FS is essentially divided into two primary substasks: the development of the alternatives and the preliminary screening/detailed screening analysis of the alternative to arrive at the recommended remedial action.

Previous studies conducted on the site, coupled with the existing data and monitor wells, make a concurrent RI/FS both possible and cost effective. By conducting the RI and the FS concurrently, data gaps identified during the FS can be addressed while conducting the RI.

The first task of the FS will commence once the remedial action objectives have been identified. General response actions (no action, on-site containment, off-site containment, treatment, etc.) will be identified as the first step for the

contaminated media present. This includes a comprehensive list of remedial alternatives, both treatment technologies and process options. Treatment technologies (physical, chemical, solidification/fixation, dewatering, etc.) will be defined for the general response actions. The technologies will be selected based on their technical ability to meet general response actions to treat or contain the contaminants on site. Based on our experience, we will eliminate technologies that are not technically feasible and focus on known processes.

Initial Screening of Alternatives

At the commencement of this subtask, remedial action objectives will be reviewed and refined as necessary. The remedial action objectives may be refined for several reasons, including (1) the process options/alternatives cannot meet objectives; (2) the objectives cannot be justified from a cost recovery standpoint; and (3) the risk assessment performed during the RI indicates different objectives.

When the remedial action objectives have been agreed upon by the EPA and DHA, an initial screening of alternatives will be conducted. The screening at this level consists of three criteria: (1) effectiveness, (2) implementability, and (3) cost. Unlike process option screening, each of the criteria will be evaluated in more depth. Vendors and references will be contacted to discuss effectiveness and implementability. Implementation schedules will be established and costs representing an accuracy of -50 and + 100 percent will be prepared.

Upon completion of the initial screening, any bench or pilot scale treatability tests will be performed under the RI work tasks. Results from the treatability tests will be incorporated into the detailed analysis.

Based on evaluations and remedial actions at other similar sites, a variety of remedial actions for the soil contamination can be cost effective, including removal, capping, solidification (for metals and nonmetallics) and vacuum extraction (for organics).

Detailed Analysis of Screened Remedial Alternatives

The detailed analysis of screened alternatives will be the final task in the feasibility study process. During this task, the alternatives which passed the initial screening phase will be further refined and some alternatives may be added if necessary - as directed by the EPA or DHA, or as indicated by the RI results.

The alternatives will be evaluated for overall protection of human health and the environment using the following criteria:

- Mitigation of long-term exposure;
- Significant reduction of toxicity, mobility, or volume;

- Technical merits of each remedial alternative relative to the other alternatives;
- Present value;
- Extent to which the alternative achieves standards and complies with Applicable Regulations;
- Community acceptance and adverse effects on local community; and
- Other significant impacts on human health and environment resulting from implementation.

Once each of the alternatives have been analyzed with respect to the above seven criteria, the alternatives will be compared against one another. A sensitivity analysis will be conducted to determine how much the variables associated with an alternative impact the seven criteria, particularly effectiveness and cost. The second task of the FS will, most likely, yield a reduced list of alternatives from which DHA will select a preferred alternative or alternatives to present to EPA.

FS Report

CDM will prepare an FS report for EPA review and approval in accordance with "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (October 1988), specifically using Table 6-5 of the guidance for report content and format. This report will include analyses related to the residual risk evaluation, as necessary. The residual risk evaluation will present analyses defining the magnitude of the risk to the public health and environment that will remain after a particular remedial alternative has been completed. The residual risk evaluation will be developed by CDM as part of evaluating each alternative in the Feasibility Study.

5 Section Five

Section 5
RI/FS Schedule

The Remedial Investigation/Feasibility Study (RI/FS) to be conducted at the DHA site will follow the proposed schedule presented in Figure 5-1. The schedule is divided into two primary activities: (1) Remedial Investigation (RI) tasks and (2) Feasibility Study (FS) tasks. Many of the RI/FS tasks are performed concurrently.

The RI phase of this project includes the following activities:

- Field Investigations,
- Sample Analyses,
- Data Interpretation and Evaluation,
- Risk Assessment for any Additional Contaminants, and
- Remedial Investigation Report.

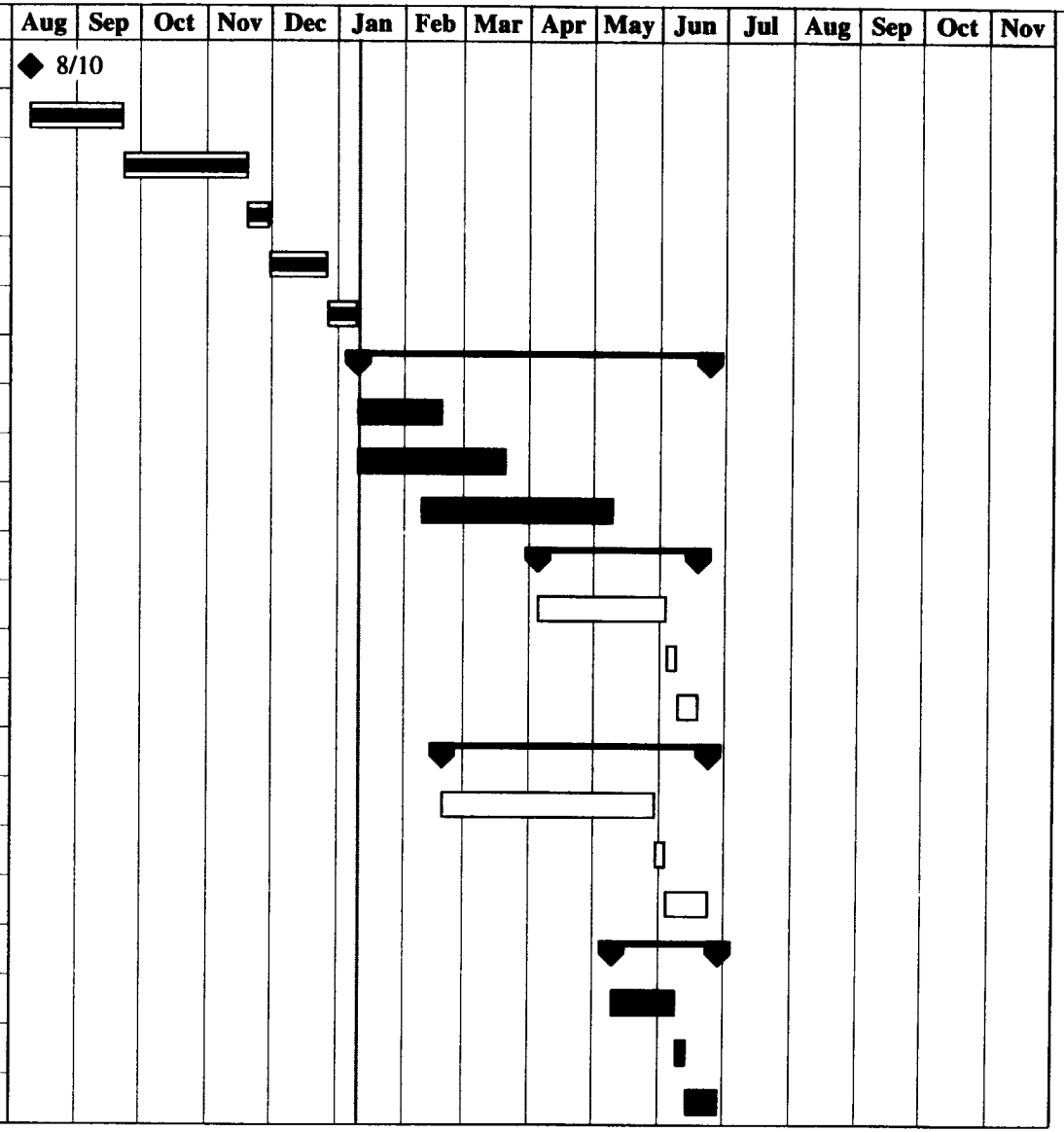
The RI phase of the project will begin will begin upon EPA approval of the final project plans and can be finished within seven months.

The feasibility study will be finalized based on the data evaluation results obtained during the Remedial Investigation. The Feasibility Study report will address any additional contaminants of concern identified during the RI activities. The FS report will be completed concurrently with the RI report.

The total time estimated for completion of the RI/FS tasks in seven months. This estimate assumes expedited laboratory turn-around time for sample analyses, and one month of review time for EPA to review all submittals from DHA.

Figure 5-1 - Dallas Housing Authority
RI/FS Schedule

ID	Name
1	Administrative Order on Consent
2	Project Scoping / Planning Documents
3	EPA and CDM Review
4	Incorporate EPA Final Comments
5	EPA Review
6	Incorporate EPA Comments for Final Report
7	**Remedial Investigation**
8	Field Investigation
9	Laboratory Analysis / Data Validation
10	Data Evaluation
11	**Risk Assessment for all COCs**
12	Draft Report
13	EPA Review
14	Incorporate EPA Comments for Final Report
15	**Remedial Investigation Report**
16	Draft Report
17	EPA Review
18	Incorporate EPA Comments for Final Report
19	**Feasibility Study**
20	Edit Draft Report
21	EPA Review
22	Incorporate EPA Comments for Final Report



CDM

Critical — Progress — Summary

Noncritical — Milestone ◆ — Rolled Up ◇

Camp Dresser McKee, Inc

6 Section Six

Section 6
RI/FS Project Team

The team CDM has selected for this project provides DHA with technical and managerial experience from similar projects around the United States. The project team is organized as shown in Figure 6-1. Staff selection for this project focuses on individuals with appropriate RI/FS experience. Senior technical personnel will oversee this operation providing guidance and insight into potential future litigation support requirements.

Chuck McLendon has been identified as the CDM Project Manager. Senior technical reviewers will include Mike Tilly, Kathleen Gill and Jennifer Alai under the direction of Roger Olsen. The Quality Assurance Manager is Dr. Rick Chappell.

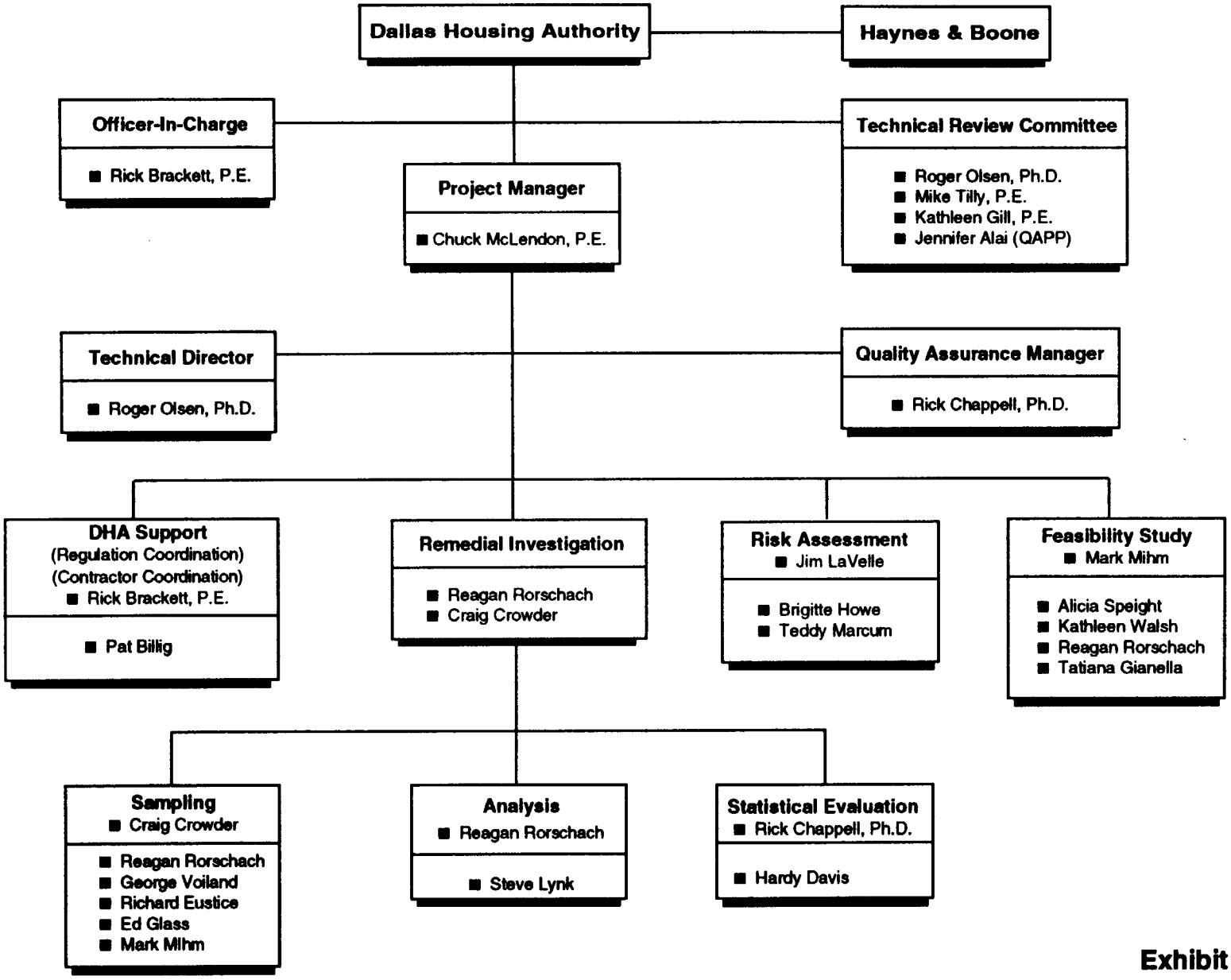


Exhibit 6-1
DHA RI/FS FSP
Personnel and Activities

7 Section Seven

Section 7
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